WHAT IS CLAIMED IS:

1. A single type of semiconductor wafer cleaning apparatus comprising:

a rotary wafer chuck on which a wafer is to be mounted and rotated;

a de-ionized water supply means for supplying de-ionized water onto the wafer to form a layer of water on the wafer;

a gas spraying unit disposed above said wafer chuck, said gas spraying unit including a gas injection tube oriented to inject gas towards a wafer mounted to the chuck, and a gas guard connected to the gas injection tube, said gas guard defining a chamber having an open bottom adjacent the rotary chuck; and

gas supply means, for supplying gases, connected to the gas injection tube.

2. The apparatus of claim 1, and further comprising an X-Y drive mechanism connected to said gas spraying unit such that the gas spraying unit can be moved forward and backward and to the right and to the left relative to an upper surface of a wafer mounted to the chuck.

3. The apparatus of claim 1, wherein said gas guard comprises a frusto-conical portion having upper and lower openings, the upper opening being smaller than the lower opening.

4. The apparatus of claim 1, wherein said gas guard has holes extending through a wall thereof that delimits said chamber.

5. The apparatus of claim 1, wherein said gas injection tube comprises a plurality of nozzles.

6. The apparatus of claim 1, wherein the gas injection tube and the gas guard are formed of a material selected from the group consisting of Teflon®, stainless steel, gold, and platinum.

7. The apparatus of claim 1, wherein the de-ionized water supplying means includes a plurality of de-ionized water supply lines.

8. The apparatus of claim 1, wherein said gas supply means includes a plurality of sources of gas selected from the group consisting of ozone (O_3), hydrofluoric acid (HF), ammonia (NH_3), carbon dioxide (CO_2), sulfur oxide (SO_2), hydrogen (H_2), nitrogen (N_2), argon (Ar), isopropyl alcohol (IPA), and a combination of gases of the group.

9. The apparatus of claim 1, and further comprising a megasonic transducer attached to the gas spraying unit so as to transmit supersonic waves via the gas guard.

10. The apparatus of claim 1, wherein the gas supply means includes a mixer for mixing a plurality of gases.

11. A wafer cleaning apparatus comprising :

a rotary wafer chuck on which a wafer is to be mounted and rotated;

a source of de-ionized water, and at least one de-ionized water supply line extending from said source of de-ionized water to a location directly above an outer portion of said wafer chuck;

a gas spraying unit disposed above said wafer chuck, said gas spraying unit including a gas injection tube having an outlet oriented to inject gas towards a wafer mounted to the chuck, and an annular gas guard attached to and extending downwardly from said gas injection tube, said annular gas guard defining a chamber beneath the outlet of said gas injection tube, the chamber having an open bottom; and

a source of cleaning gas connected to said gas injection tube.

12. The apparatus of claim 11, and further comprising a drive mechanism that moves said gas spraying unit relative to a wafer mounted to said chuck relative to one another in a plane parallel to an upper surface of the wafer, whereby the upper surface of the wafer can be scanned with gas issuing from the gas injection tube of said gas spraying unit.

13. The apparatus of claim 11, wherein said gas guard comprises a frusto-conical portion.

14. The apparatus of claim 11, wherein said gas guard has holes extending through a wall thereof that delimits said chamber.

15. The apparatus of claim 11, wherein said gas injection tube comprises a plurality of nozzles, and said source of cleaning gas is connected to at least one of said nozzles.

16. The apparatus of claim 15, and further comprising a source of isopropyl alcohol connected to one of said nozzles, whereby a wafer mounted to said rotary chuck can be dried.

17. The apparatus of claim 15, wherein said cleaning gas includes at least one gas selected from the group consisting of ozone (O_3), hydrofluoric acid (HF), ammonia (NH_3), carbon dioxide (CO_2), sulfur oxide (SO_2), hydrogen (H_2), nitrogen (N_2), argon (Ar), isopropyl alcohol (IPA).

18. The apparatus of claim 1, and further comprising a megasonic transducer attached to the gas spraying unit so as to transmit supersonic waves via the gas guard.

19. A method of cleaning a semiconductor wafer, comprising:

mounting a wafer to a chuck;

spraying de-ionized water onto the wafer while rotating the chuck, to thereby form a layer of water on the wafer;

positioning a gas guard, defining therein a chamber having an open bottom, immediately above the layer of water;

spraying a cleaning gas through the chamber and into the layer of water to thereby cause the cleaning gas to dissolve in the layer of water, and at the same time moving the chamber across the surface of the wafer, to thereby clean the wafer; and

subsequently injecting a drying gas into the layer of water on the cleaned wafer, to thereby dry the cleaned wafer.

20. The method of claim 19, wherein the cleaning gas is selected from the group of gases consisting of ozone (O_3), hydrofluoric acid (HF), ammonia (NH_3), carbon dioxide (CO_2), sulfur oxide (SO_2), hydrogen (H_2), and a combination of the gases.

21. The method of claim 19, wherein said positioning of the gas guard comprises maintaining the bottom of the gas guard at a distance of 2 - 4 mm above the layer of water while the cleaning gas is sprayed.

22. The method of claim 19, wherein the pressure within the chamber is maintained between 1 - 2 atm.

23. The method of claim 19, wherein the chuck is rotated at 5 -100 rpm from the time the layer of water is formed through the time the cleaning gas is sprayed.

24. The method of claim 19, wherein the drying gas is isopropyl alcohol.

25. The method of claim 24, wherein the chuck is rotated at 5 -1500 rpm during the time the wafer is being dried by the isopropyl alcohol.